Base from U.S. Geological Survey, 1953

ALASKA

QUADRANGLE LOCATION

Average densities of granitic and sedimentary rocks are slightly higher than reported in 1966, and densities of mafic volcanic rocks are

the same as reported in 1966. We do not regard the apparent differences

as significant because of the much smaller number of samples available

for the 1966 report. The average density of the granitic rocks and mafic

volcanic rocks is normal and consistent with their mineralogy and degree

high, but these rocks have low porosity and are hard, indurated graywacke,

For purposes of this discussion, typical oceanic crust is considered to be relatively thin, 10-20 km, of high mean density, ~2.9 g/cm<sup>3</sup>, and

composed largely of mafic to ultramafic rocks; typical continental crust

is considered to be relatively thick, 25 km or more, of lower mean density,

static equilibrium exist across continental margins, it has long been known

that gravity anomalies follow standard patterns (see, for example, Woollard

~2.8 g/cm<sup>3</sup>, and composed of an upper part that is sialic or femic and a

lower part that is mafic or ultramafic. Where conditions of normal iso-

and Strange, 1962, Demenitskya and Belyaevsky, 1969): Over deep ocean

basins, Bouguer anomalies tend to be strongly positive -- a combination of

the mass effect of relatively dense oceanic crust and an excess mass effect

caused by replacement of the water layer by a fictitious rock layer having

on the order of +300 mgal where water depths are about 4-5 km. Along con-

thicker, low-density continental crust, and to become more negative with

Chugach Mountains and -160 mgal in the Wrangell Mountains (Barnes, 1976).

However, the crust in regions of complex tectonic convergence, such as

higher elevation. In Alaska, values are as negative as -110 mgal in the

in south-central Alaska, may be a mixed or transitional crust: oceanic lithosphere from the Pacific region probably has been underthrusting the

continental margin since the Mesozoic and possibly earlier time and thus

imbricate slabs of oceanic material, perhaps intermixed with continentally

derived material. A pre-Mesozoic crystalline basement or continental crust

Although the continental margin of southern Alaska is geologically

complex and tectonically active, lying between the Aleutian trench to the

south, the active volcanic belts of the Alaska Peninsula to the west, and

Wrangell Mountains to the north, regional gravity anomaly values in the

owing to relative simple geometry of subduction wedges. Free-air anomaly

values range from +20 to +50 mgal in the southeast part of the area, where

Sound, or within Prince William Sound proper in its eastern part (Barnes,

Chugach Mountains to -80 mgal near Turnagain Arm and to -110 mgal in the

Anchorage quadrangle to the north.

for resolution of the problem.

. Values decrease very smoothly northwestward across the Kenai-

Earlier analysis of regional gravity data indicated to Case, Barnes,

Plafker, and Robbins (1966) that these trends are consistent with a change

From a refraction shot in College Fiord, Hales and Asada (1966) derived a mean crustal thickness, north from the shot, of 52.1 to 53 km, depending

on the number of assumed crustal layers. Southwestward, toward the Kenai

Peninsula, the mean crustal thickness was found to be about 35 km. Shor,

Thus a major question that remains to be answered is where is the

Menard, and Raitt (1970) found that the crustal thickness near the continental margin of the eastern Gulf of Alaska is about 15.4 km.

Positive Anomalies Over Belts of Mafic and Ultramafic Rock

sent anomalies over belts of mafic and ultramafic rock.

Three main relative gravity highs, superimposed on the regional gravity

Seldovia high--In the extreme northwest corner of the area, an elongate

gradient that decreases northwestward across the area, are believed to repre-

relative gravity high of perhaps 10-20 mgal trends north along the front of

southwest of the map area to Seldovia and then southwest along Kodiak Island

and possibly as far as the Shumagin Islands (Barnes, 1977), generally on the

west side of the Border Ranges fault (MacKevett and Plafker, 1974). The

anomaly extends north and east of the area as an arcuate feature near the

azlina, Matanuska, Copper, and Chitina Rivers, almost to the Canadian

Border Ranges fault. A prominent magnetic high occurs near or parallel to the gravity anomaly along the Kenai Lowlands and northward. This magnetic

anomaly was termed the Knik Arm anomaly by Grantz, Zeitz, and Andreasen

(1963), and Andrew Griscom (oral commun., 1975) has proposed that the Knik

Arm anomaly reflects a belt of concealed mafic-ultramafic rocks. We like-

wise interpret the gravity anomaly as being caused by a major belt of mafic-

ultramafic rocks, even though the belt is locally offset from the magnetic

Resurrection high--A residual gravity high of 20-30 mgal occurs over

the complex of sheeted dikes, pillow basalts, and gabbro of the Resurrection

Peninsula. The complex represents the west part of a north-plunging anticline that has been truncated on the east by the Placer River fault (Tysdal

and Case, 1977a). The fault is upthrown on the west side. Although compli-

locally interlayered with flysch, and an uppermost sequence of metatuffs,

aspect of a very small scale spreading ridge and may represent mafic igneous

activity along a leaky transform fault (Tysdal and others, 1977). Consider-

ing the station spacing, correlation of the positive anomaly with the mafic

largely confined to the exposed parts of the complex. However, the poorly

controlled contours north of the complex define a broad nose that diverges

not normally be considered of significance, but a parallel northwest-trending

concealed ultramafic mass (Case and others, 1979). The axis of the gravity

breadth of the high is greater to the west of the axis than to the east, as

is that of the associated magnetic high. The extent of the high over flysch

deposits on the west side of Resurrection Bay indicates that mafic rocks are

mafic rocks at depth west of Resurrection Bay. These relations may indicate

present at no great depth. Magnetic data likewise suggest extension of the

(perhaps the site of the younger Placer River fault) and a gentler western

The available land gravity data suggest that the mafic-ultramafic

rocks may extend at least as far south as Aialik Cape. A single line

of marine data suggests that the gravity high continues south to near

59°30'N, where magnetic surveys were terminated (Case and others, 1979).

From the combined magnetic and gravity data, the concealed and exposed

complex extends northerly for at least 70 km from 59°30'N. Its average

Although gravity control is relatively poor across the strike of the

anomaly, some estimates can be made of the configuration and mass causing

A body having an exposed breadth of about 5 km in the upper part and 18 km

consistent with a mean density of 2.9 g/cm3 for the mafic complex and 2.7

plex underlying the Resurrection Peninsula is not very thick and could be

that the Placer River fault, which is a high-angle reverse fault, flattens

Prince William Sound high—A major gravity high extends northeast as a great arcuate feature from about lat 59°45'N, long 148°15'W, across

Elrington, Evans, and Baimbridge Islands, then across Knight Island, to

Glacier Island in the northeast corner of the Seward quadrangle. In the

Cordova quadrangle, it comtinues eastward across the Ellamar Peninsula

islands and the mainland and is undoubtedly caused by these relatively

dense rocks. The anomaly over Knight Island was modeled and described

shapes of the gravity contours and the position of the axis of the high.

Because the modeling and interpretation of the anomaly have remained

rather completely by Case, Barnes, Plafker, and Robbins (1966). New

gravity data obtained during 1976 required only minor changes in the

essentially unchanged since 1966, part of the previous discussion is

B-B' across Knight Island to obtain complete Bouguer anomaly values.

60 mgal over the central part of the island (fig. 2). The residual

and a regional Bouguer anomaly field was subtracted to obtain a residual

anomaly over the mafic belt of the island. The residual anomaly is about

anomaly can be caused by a two-dimensional body having a density contrast

of about +0.2 g/cm<sup>3</sup>, surface breadth of about 12 km, downward extent of

about 12 km. and a lower breadth of more than 20 km. Contacts of the

anomalous dip northwest, and the northwestern contact dips more gently

than the southeastern. Thus, the model represents an asymmetrical mass

If the mean density contrast is less than 0.2 g/cm<sup>3</sup>, the mafic mass

may extend to depths greater than 12 km. If the mean density contrast is greater than 0.2 g/cm<sup>3</sup>, the mass may extend to depths less than 12 km,

but we believe that 5-6 km is a minimum for the depth. If this mafic belt

has been emplaced along a thrust fault that dips northwest, then the fault

surface probably lies at a depth of at least 5 km, and, more likely, about

Montague Strait fault, east of Knight Island, could dip northwest beneath

The lower amplitude of the southern part of the gravity high (over

A saddle in the gravity high near Storey, Peak, and Naked Islands may

Complete Bouguer anomaly

well be a true structural saddle because only a few mafic rocks have been

found on these islands, yet a large mass of mafic rocks is surely present

Elrington, Evans, and Bainbridge Islands) and the narrower outcrop width

of the mafic complex indicate that a smaller mass is present near the surface and that perhaps the thickness is considerably less than at Knight

southeast part of the island, over the sheeted dike complex, and the

offshore data suggest that the main axis of the high occurs offshore

Assumed regional Bouguer anomaly

∴ Mafic ∴

Complex

Island. To the northeast, the high near Glacier Island occurs at the

10 km below the main outcrop area of the complex on Knight Island. The

to readers interested in the resource appraisal.

whose breadth increases with depth.

at depth to cause the continuous high.

Simple Bouguer anomaly

south of the island.

briefly summarized, with minor changes, in this report as a convenience

Terrain corrections were made for selected stations along profile

and the Copper River and possibly beyond (Barnes, 1977). This remarkable

gravity high correlates very closely with the mafic rocks exposed on the

westward to pass beneath the complex. If the density contrast is less than

cut off by a thrust fault at a depth of about 5 km. We might speculate

0.2 g/cm3, then the mafic complex extends to greater depth.

g/cm<sup>3</sup> for the adjacent sedimentary rocks--yields a computed gravity anomaly of about 30 mgal. If the density contrast is 0.2 g/cm3 or greater, the com-

at the base, a thickness of 5 km, and a density contrast of +0.2 g/cm<sup>3</sup>--

the anomaly by use of Hubbert's (1948) techniques for computations of

gravity anomalfes caused by two-dimensional bodies (Profile A-A', fig. 1

59°30'N. The magnetic anomalies likewise continue south to at least

breadth is on the order of 10-15 km.

magnetic anomaly that occurs in the same region has been interpreted as a

complex is excellent. The anomaly trends north-south and appears to be

from the trend of the complex and strikes somewhat north-northwest to the

area just north of Seward. Because of the poor control, this nose would

high appears to overlie the sheeted dike-pillow basalt complex, and the

that the original anticline was asymmetric, having a steep eastern limb

cated by local folds and faults, the sequence (not necessarily in stratigraphic order) from east to west is approximately as follows: serpentinite and gabbro, a sheeted dike complex, a west-dipping sequence of pillow basalts,

overlain by and interlayered with flysch. The entire sequence has the

border (Barnes, 1977); again, it tends to lie north of the trace of the

the Kenai Mountains. This anomaly is part of a much larger high that extends

in crustal thickness from about 20 km near the continental margin, as

measured by Shor (1962) southeast of Kodiak Island, to about 50 km near

College Fiord just north of the map area (Woollard and others, 1960).

Seward-Blying Sound area vary in a remarkably smooth pattern, perhaps

water depths are about 100 to 200 m. The zero Bouguer anomaly contour generally lies close to the shoreline of Blying Sound and Prince William

the "basement" beneath the Mesozoic and Cenozoic flysch may comprise

may not be present, according to many modern schemes of plate tectonics (see Plafker, 1972, for example).

a density of 2.67 g/cm<sup>3</sup>--an over correction that leads to Bouguer anomalies

tinental margins, the Bouguer anomalies tend to average about zero or to be

slightly positive. Inland, Bouguer anomalies tend to be negative because of

of porosity. The densities of the sedimentary rocks may appear somewhat

Interpretation of the Gravity Anomaly Map

metagraywacke, argillite, and slate.

Crustal structure

FOLIO OF THE SEWARD AND BLYING SOUND QUADRANGLES, ALASKA

MISCELLANEOUS FIELD STUDIES MAP MF - 880-C CASE AND OTHERS GEOLOGIC INTERPRETATION OF GRAVITY ANOMALY MAP

In the southeastern part of the area, a large regional gravity high naving values of around +40 mgal occurs just south of Montague Island. This high partly coincides with a major northwest-trending magnetic high (Case and others, (1979) and is probably caused by a mafic or ultramafic mass that is buried 5-10 km or more below the surface. The magnetic high extends beyond the gravity high, both to the northwest and to the southeast, and suggests that the main mass causing the anomalies is ultramafic rock that has a variable degree of serpentinization along strike. Where magnetic and gravity highs coincide, as south of Montague Island, the mass is probably relatively unserpentinized. Where no special gravity highs are present, as southwest of Montague Island, the serpentinization is probably greater, leading to reduced density of the mass.

Some Regional Gravity Lows Kenai-Chugach low--In the northwestern part of the map area, a major regional gravity low trends northeast along the Kenai Mountains and across Turnagain Arm. This low is a prolongation of the long regional low in southern Alaska that occurs over the Chugach Mountains to the north and continues southwestward across Kodiak Island (Barnes, 1977). North of the Seward and Blying Sound quadrangles, the low trends east to near the community of Chitina (Barnes, 1977). The low is caused by a combination of very thick flysch deposits plus the isostatic effect of high mountain topography. In the Seward and Blying Sound quadrangles, the gravity low crudely coincides with the axis of a suspected synclinorium in the flysch sequence, near Resurrection Creek (Tysdal and Case, 1977b).

Although it is believed that the low is caused primarily by the very thick Mesozoic flysch sequence of the Kenai-Chugach terrane, the low north f the area locally extends over Paleozoic rocks as well (MacKevett and Plafker, 1974; Beikman, 1974), north of the Border Ranges fault in the vicinity of the Chitina River. These relations can be interpreted as indicating that thick Mesozoic flysch extends beneath the thrust plate that has been identified near Chitina.

Sargent low--A poorly controlled gravity low trends north-northeast over the Sargent Icefield and southward into Blying Sound, according to limited offshore data. The low is in part an apparent low between the Resurrection and Prince William Sound gravity highs, and it coincides with a very thick section of flysch, possibly in a synclinorium.

Prince William Sound low--A major regional gravity low trends northeast across Prince William Sound between Knight Island and Montague Island. East of the quadrangle, the low bends easterly and has been inferred to extend several hundred kilometers east of the sound (Barnes, 1977). The low is bordered on the northwest by the Montague Strait fault; rocks to the southeast are of lower metamorphic grade than those to the northwest of the fault (Tysdal and Case, in press). The low is probably related to although granitic bodies east of the Sound may also contribute to the

Gravity Anomalies Related to Other Rock Units The larger anomalies described above are the only ones for which we believe a reasonable geologic interpretation is possible because of the relatively sparse control and because terrain corrections have not been made for most of the stations. But we emphasize that where gravity overage is available, the granitic bodies, throughout the area, and the schist belt, north of the Resurrection Peninsula, appear to have few or no associated anomalies; thus their mean densities are close to those of the adjacent sedimentary rocks.

Possible Relations Between Gravity Anomalies, Mineral Resources, and Oil and Gas Resources It has long been recognized that copper deposits and prospects of the Prince William Sound region show an excellent correlation with the gravity nighs that occur over the complexes of mafic and ultramafic rocks and that the gold placers and lode deposits tend to occur in a broad area west and

boundary between true oceanic crust and true continental crust in this north of the gravity highs and copper deposits (Barnes, 1971). In this region of tectonic convergence between an oceanic plate and continental section, we speculate on how such correlations can be used as a guide to plate? The answer to this question is critical in a long-term resource appraisal because it bears directly on the origin of the mafic and ultraappraisal of resources of minerals and oil and gas. Gold--Most of the lode (in quartz veins) and placer gold deposits of chromite deposits and on the origin of the gold-bearing dikes, veins, and he Seward and Blying Sound quadrangles occur in the Kenai-Chugach gravity placers. Seismic velocities beneath the Kenai Peninsula and Chugach low in the northwestern part of the quadrangle or on the edge of the low Mountains reported by Hales and Asada (1966) are consistent with either near Port Wells, close to the north-central edge of the quadrangle. Thus, an oceanic or continental crust. The regional gravity field is consistent with a crust under the Kenai-Chugach Mountains that is either continental the gold is inferred to occur in areas of very thick, deformed flysch or oceanic depending on the thickness of the deformed wedge of late Mesozoic and early Tertiary flysch deposits. If the deformed flysch sequence is very in areas of thickened flysch in the northwestern part of the map area thick, on the order of 10 km or more, as suggested by geologic mapping suggests that two other areas of thickened flysch and associated gravity lows, the Sargent low and the Prince William Sound low, might constitute (Tysdal and Case, in press), the lower crust is probably oceanic. If the favorable areas for gold. On the basis of magnetic data, the basement is lysch sequence is relatively thin, then the crust is probably continental. More sophisticated and detailed modern refraction surveys will be required perhaps deeper immediately west of the axis of the Sargent gravity low than to the east of the axis, so perhaps the western area might be more favorable than the eastern. However, the Prince William Sound low is probably relatively unfavorable for gold deposits because of water cover,

> anomalies. The areas of both gravity lows, however, were prospected by miners in the early part of this century and no gold was found. Copper deposits--Virtually all of the significant copper deposits, occurrences, and prospects of the Seward and Blying Sound quadrangles have a close areal association with the mafic complexes of the Resurrection Peninsula and Prince William Sound. Although massive sulfide deposits at Latouche Island occur in flysch deposits along a fault zone, these flysch deposits are separated laterally from the main mafic complex by only a few kilometers, and, if our supposition is correct that the main mafic mass is exposed in an anticline, mafic rocks probably occur at no great depth beneath Latouche Island; indeed, a few small mafic bodies crop out on the island. Other copper-bearing massive sulfide deposits occur in the mafic rocks of Knight Island as well as on the Ellamar Peninsula, in the Cordova quadrangle to the east. Winkler, MacKevett, and Nelson (1977) believed that the deposits are syngenetic and related

and because geologic and geochemical data indicate no gold anomalies. Green Island, the southeastern part of Latouche Island, and the north-

western part of Montague Island, in contrast, are partly in the area of the gravity low and have not been sampled adequately for geochemical

The positive gravity anomalies appear to constitute regional ore guides because they indicate terrane underlain by mafic rocks and virtually all geologists, (for example, Moffitt, 1954) who have worked in the area have noted that the copper deposits are spatially associated with the mafic rocks. Thus, any site along the Resurrection high and Prince William Sound high, both onshore and offshore, should be considered favorable for prospecting for copper deposits.

to recurrent tholeiitic volcanism.

Chromite and nickel deposits -- Although minor chromite and nickel occurrences have been found on the Resurrection Peninsula, none is of current economic significance. Because these deposits are primarily associated with serpentinized rock (of relatively low density), the regional gravity highs are not good ore guides for specific target areas. Magnetic anomalies are probably more useful. However, less serpentinized ultramafic rocks may well occur at depth in the cores of the anticlines inferred under the Resurrection and Prince William Sound highs, and such rocks might contain chromite and nickel.

Oil and gas--All of the gravity lows identified in the Seward and Blying Sound quadrangles are underlain by indurated flysch deposits with unfavorable reservoir characteristics and by local granitic bodies Although we have not examined offshore multi-channel seismic profiles in any detail, it appears likely that no sedimentary sequence having favorable porosity, permeability, and thickness for oil and gas accumulation occurs in the Seward and northern part of the Blying Sound quadrangles.

Acknowledgments We wish to thank G. R. Winkler, E. M. MacKevett, Jr., George Plafker, Travis Hudson, and Andrew Griscom for many stimulating discussions in the field and office that have clarified our concepts of the regional geology, tectonic evolution, and origin of ore deposits in the area. At various times, S. L. Robbins, W. H. Bastian, L. R. Mayo, and Steve W. Woodcock collected gravity data. Some gravity reduction and calculations were made by S. L. Robbins and L. J. LaPointe. Carter Roberts and Donald Plouff provided initial help on the computed anomalies for the Resurrection Peninsula mass. Roland von Huene and Nardia Sasnett generously provided the free-air anomaly data in the southern part of the area.

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Alaska: U.S. Geological Survey Miscellaneous Investigations Map

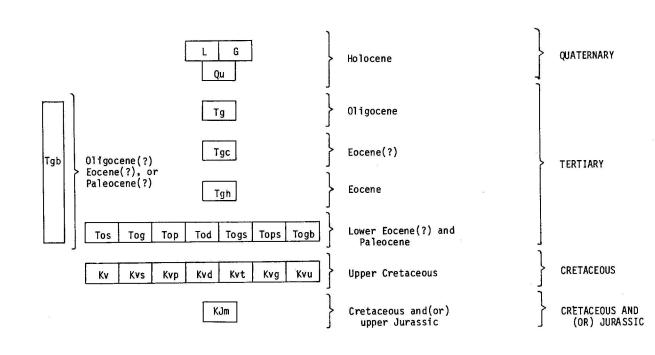
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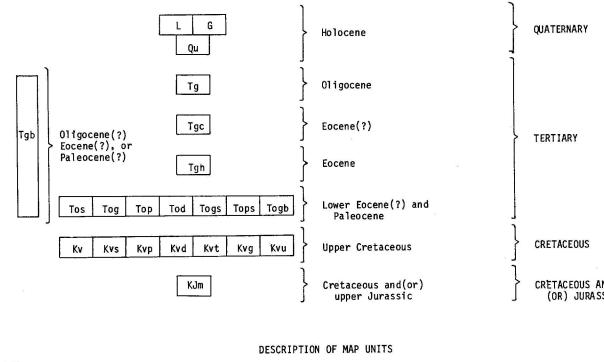
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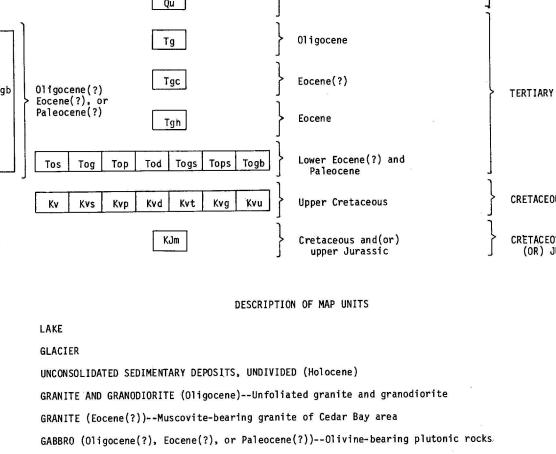
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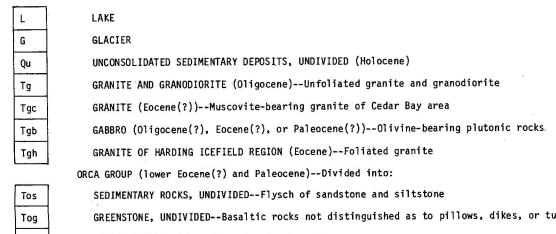
THIS MAP IS ONE OF A SERIES, ALL BEARING THE NUMBER MF- 880 BACKGROUND INFORMATION RELATING TO THIS MAP IS PUBLISHED AS U.S. GEOLOGICAL SURVEY CIRCULAR 760, AVAILABLE FREE FROM U.S. GEOLOGICAL SURVEY, RESTON, VA. 22092 Interior--Geological Survey, Reston, Va.-- 1979 For sale by Branch of Distribution, U. S. Geological Survey Box 25286, Federal Center, Denver, CO 80225



CORRELATION OF MAP UNITS







S O U N

GREENSTONE, UNDIVIDED--Basaltic rocks not distinguished as to pillows, dikes, or tuffs PILLOW BASALT--Submarine extrusive basalt SHEETED BASALT DIKES--Sequence composed almost wholly of dikes GREENSTONE AND SEDIMENTARY ROCKS--Basalt sills and dikes intruding flysch PILLOW BASALT AND SEDIMENTARY ROCKS--Interbedded pillow basalt and flysch GABBRO--Small plutons and locally coarse-grained dikes

VALDEZ GROUP (Upper Cretaceous) -- Divided into: SEDIMENTARY ROCKS, UNDIVIDED--Flysch of sandstone and siltstone, in part metamorphosed to slate and phyllite SCHIST--Sandstone, siltstone, and some tuffs metamorphosed to biotite grade of greenschist facies PILLOW BASALT--Submarine extrusive basalt SHEETED BASALT DIKES--Sequence composed almost wholly of dikes

TUFF--Aquagene tuff interbedded with flysch GABBRO--Large pluton that intrudes sheeted dikes and flysch ULTRAMAFIC ROCKS--Small tabular bodies of serpentinized dunite McHUGH COMPLEX (Cretaceous and(or) Jurassic)

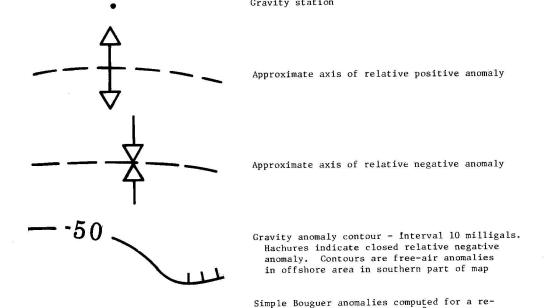
McHUGH COMPLEX--Weakly metamorphosed clastic and volcanic rocks; in large part is a melange

Contact--Dashed where approximately located; dotted where concealed High-angle fault--Dotted where concealed Thrust fault--Dotted where concealed. Sawteeth on upper plate Gravity station

duction density of 2.67 g/cm<sup>3</sup>. Gravity datum

from the 1967 Geodetic Reference System

is from IGSN 1971, and the reduction ellipsoid



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GEOLOGIC INTERPRETATION OF THE GRAVITY ANOMALY MAP OF THE SEWARD AND BLYING SOUND QUADRANGLES, ALASKA

For more than 20 years, gravity surveys have been conducted in the vicinity of Prince William Sound, the epicentral region of the great Alaska earthquake of March 27, 1964. Some of the major regional gravity anomalies were outlined by Thiel, Ostenso, Bonini, and Woollard (1958, 1959) and Woollard, Ostenso, Thiel, and Bonini (1960), and additional anomalies were defined by pre- and post-earthquake gravity studies reported by Barnes and Allen (1965) and Case, Barnes, Plafker, and Robbins (1966). Another gravity anomaly map was prepared by personnel of the U.S. Coast and Geodetic Survey (now the National Oceanic and Atmospheric Administration) (Wood, 1966, p. 131; Rice, 1969, p. 5-20). Case, Barnes, Plafker, and Robbins (1966); Rice's interpretation concerned mainly gravity changes related to the earthquake, and the data were not interpreted in terms of regional geology, New gravity stations were established in 1976 as part of the mineral resource appraisal of the Seward and Blying Sound quadrangles. This report incorporates the new data obtained in 1976, reinterprets some anomalies previously discussed by Case, Barnes, Plafker, and Robbins (1966), and interprets other anomalies not previously discussed. Descriptions of the major rock units and structural features are found in the companion report by Tysdal and Case (in press). An interpretation of the aeromagnetic map of the region has

been prepared by Case, Tysdal, Hillhouse, and Gromme (1979). Most of the gravity measurements were made with LaCoste & Romberg geodetic gravity meters, but some data were obtained with World Wide and Worden gravity meters. Positional control was obtained from standard topographic maps, scale 1:63,360 and 1:250,000. The primary base for the 1976 survey was at Seward at the corner of 5th and Adams Street, on the bottom step of the Ray Building and above U.S. Tidal Benchmark 11, where the established gravity value is 981,919.12 mgal on the 1971 datum. Elevation control at shoreline stations was obtained from measured height above water and application of tide correction to determine elevation with respect to mean tide level; elevation control at inland stations was obtained from altimetry and bench marks. Elevations for land stations are with respect to post-earthquake mean sea level. Elevations at shoreline stations are probably accurate to within 1 meter, and those based on altimetric surveys are probably accurate to 15 m. Positions for most stations are probably accurate to within 100 m. Data reduction was by standard techniques for Alaskan data (Barnes, 1972, 1976). The gravity datum is from IGSN 1971, and the reduction ellipsoid from the 1967 Geodetic Reference System. The reduction density is 2.67 grams per cubic centimeter (g/cm<sup>3</sup>). Drift control for the 1964 surveys was described by Case, Barnes, Plafker, and Robbins (1966), and similar procedures were followed in the

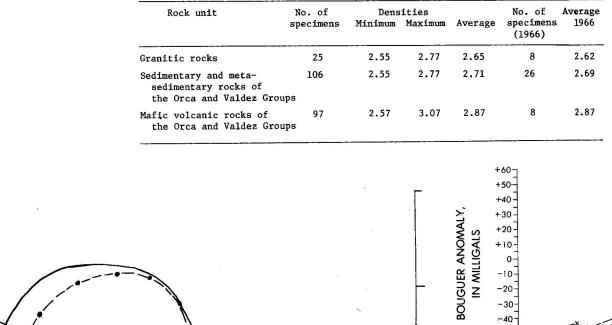
land stations are accurate to within about 3 mgal. Marine gravity data in Prince William Sound were obtained on several U.S. Coast and Geodetic Survey-National Oceanic and Atmospheric Administration cruises during the 1960's and early 1970's. The earlier data were partly reduced by David F. Barnes. Because cross-coupling corrections were not made for some of the data and because of uncertainty in the navigation and water depths, the marine values of the surveys within the sound are estimated to an accuracy of about +10 mgal, on the basis of values where nearby land data were available. In the Gulf of Alaska, data are from a 1972 Surveyor cruise and, on the basis of crossing errors, are probably more accurate. These data were provided by Roland Von Huene and lardia Sasnett, U.S. Geological Survey. Data in the Gulf of Alaska are free-air anomalies. Note that free-air anomalies can be readily converted to simple Bouguer anomalies for the standard reduction density of 2.67  $g/cm^3$  by multiplying water depth, in meters, by 0.06886 and adding to

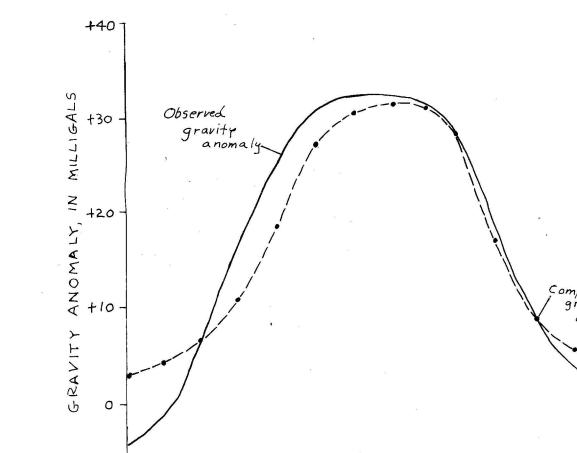
1976 surveys. We estimate that the simple Bouguer anomaly values for most

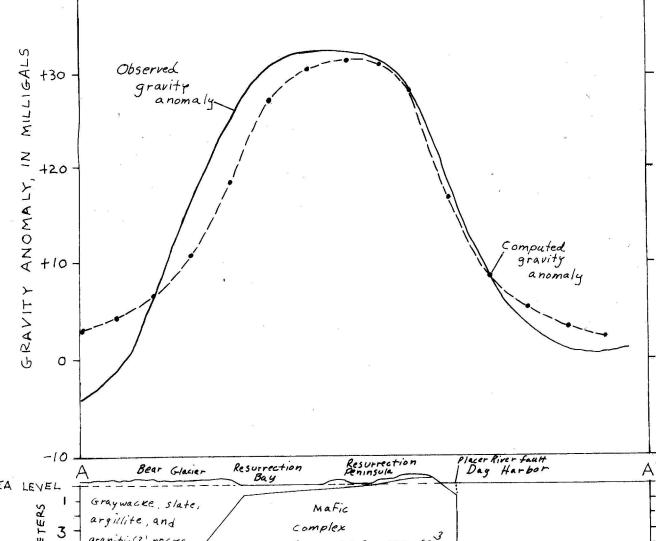
A simple Bouguer anomaly map is one for which the mass effects of terrain have not been corrected. Where corrections for terrain have been made, complete Bouguer anomalies are generally somewhat more positive than the simple Bouguer anomalies. In regions of rugged, mountainous topography as in the Seward and Blying Sound quadrangles, terrain corrections are commonly 2-10 mgal, or more, depending on details of terrain in the neighborhood of the station. From a few trial terrain corrections, we estimate that complete Bouguer anomalies for most of the map would be 2-10 mgal more positive than values shown on this simple Bouguer anomaly map. Small, apparent, closed anomalies or small, abrupt flexures in the contours on the simple Bouguer anomaly map may well represent effects of terrain, elevation errors, positional errors, or reading errors--or some combination of these--and should be ignored for purposes of regional geologic interpretation.

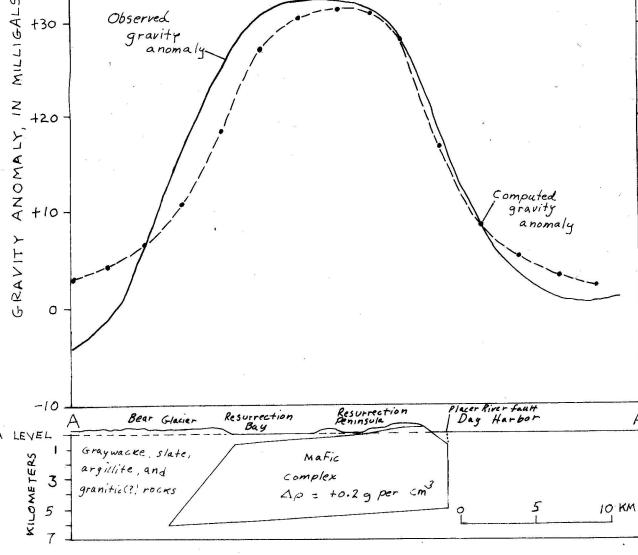
Densities Densities have been measured for a large number of rock specimens from the Prince William Sound region. Most of the samples were collected in the Seward and Blying Sound quadrangles, but some were collected from the Valdez and Cordova quadrangles to the east. The table below summarizes data on all samples as compared with data reported in 1966 (Case and others, 1966,

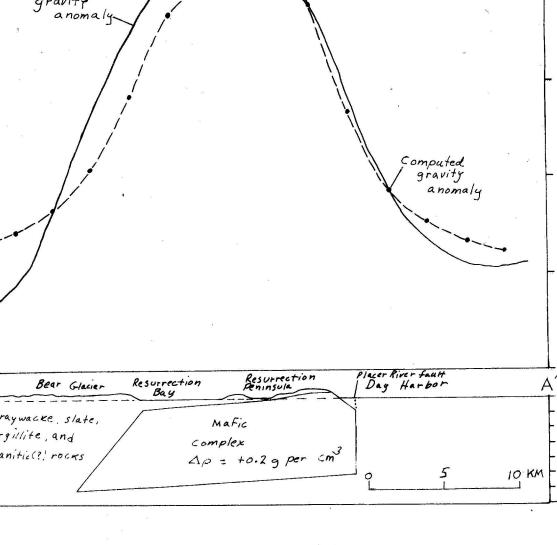
Rock unit	No. of specimens	Densities			No. of	Average
		Minimum	Maximum	Average	specimens (1966)	1966
Granitic rocks	25	2.55	2.77	2.65	8	2.62
Sedimentary and meta- sedimentary rocks of the Orca and Valdez Grou	106 ps	2.55	2.77	2.71	26	2.69
Mafic volcanic rocks of the Orca and Valdez Grou	97 ps	2.57	3.07	2.87	8	2.87

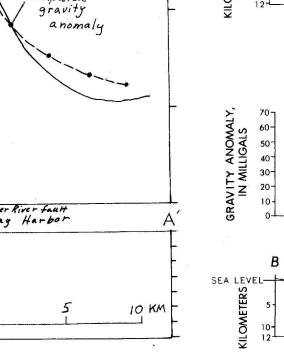


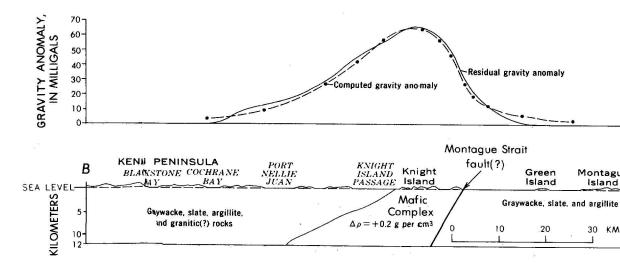












gravity anomaly over Knight Island. Δρ is the density contrast. Modified from Case, Barnes, Plafker, and

Robbins (1966).

J.E. CASE, ROBERT SIKORA, R.G. TYSDAL, DAVID F. BARNES, AND ROBERT MORIN

5 0 5 10 15 20 25 MILES

CONTOUR INTERVAL 200 FEET

DATUM IS MEAN SEA LEVEL

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Geology modified from Tysdal and Case(in press)

LOCATION INDEX

TYONEK ANCHORAGE VALDEZ

SEWARD

SOUND

150°

KENAI

SELDOVIA

CORDOVA

ISLAND

BLYING | MIDDLETON

complex of the Resurrection high. Ap is the density contrast.

Figure 1. Simplified interpretation of the gravity anomaly across mafic